As the name implies, episodes of head pain come in clusters and the patient usually has experienced it before.

From this very brief review it should be obvious that the most important diagnostic criterion for a warning leak is that it is a new type of headache for the patient under consideration. In addition, the "warning leak" headache is sudden in onset, not associated with fever and does not respond to mild headache remedies. Therefore, to insure proper diagnosis any patient over 40 years old in whom a headache of abrupt onset develops which is atypical for him or her and persists for 24 hours should be considered for the possibility of a warning leak.

The only way to rule in or out a small subarachnoid hemorrhage is to do a lumbar puncture, but this does not exclude an unruptured aneurysm. The potential advantage of establishing the diagnosis early in the course of the disease is sufficient to justify an aggressive approach. If the lumbar puncture is done with a 20 gauge needle it can be carried out on an out-patient basis with the patient returning home after a 30 minute rest if the tap is negative. If the tap is positive a cerebral arteriogram is, of course, in order.

JOHN F. ALKSNE, MD

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Transnasal Approach to Pituitary Tumors

THE SUBLABIAL-TRANSNASAL-TRANSSPHENOIDAL removal of pituitary tumors has been revived as a direct result of two technical advances: (1) the operating microscope with its intense illumination and magnification both being required for extirpation of 3 to 5 mm adenomas buried within traoperative fluoroscopic visualization of the sur- an otherwise normal pituitary gland, and (2) ingical field.

Most large nonsecreting pituitary tumors (for example, the classical "chromophobe" adenoma causing a ballooned sella, hypopituitarism and bitemporal hemianopsia) can be removed safely and effectively by the transsphenoidal approach as an alternative to craniotomy. In addition, the transsphenoidal technique has ushered in a fascinating new field of endocrine microsurgery. Secreting pituitary microadenomas measuring 2 to 10 mm in diameter can produce distinctive manifestations of hormone overproduction: gigantism and acromegaly (growth hormone), Cushing disease (adrenocorticotropic hormone) and the Forbes-Albright syndrome of amenorrhea and galactorrhea (prolactin).

The clinical features evolve in advance of changes detectable on standard radiographs of the skull, but sella turcica polytomograms will show subtle abnormalities in most cases. Practically speaking, the diagnosis of a secreting pituitary microadenoma is based upon endocrine criteria. The surgeon's dual objective, complete removal of the microadenoma and preservation of normal pituitary function, has been achieved by transsphenoidal microsurgery with results equal or superior to those obtained by other surgical and nonsurgical methods.

C. B. WILSON, MD

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Percutaneous Radiofrequency Cervical Cordotomy: Treatment of Chronic Intractable Pain

PERCUTANEOUS RADIOFREQUENCY CERVICAL CORDOTOMY is a procedure with stereotactic features made possible by recent advances in radiographic technology. Under local anesthesia, a needle electrode is inserted percutaneously into the spinothalamic tract of the cervical spinal cord. Needle placement is monitored by x-ray control and impedance measurements. Precise localization is verified by stimulation. A radiofrequency current is used to make a thermal lesion, the size of which is a variable of electrical amperage and the time applied. Lesion making is monitored clinically by patient response. Barring concurrent medical problems, most patients are ambulatory on the following day and are able to leave the hospital within two or three days.

Satisfactory results depend on appropriate patient selection based upon explicit criteria. The pain should be chronic and intractable—that is, nonresponsive to disease specific therapy. Significant emotional problems must be properly evaluated and screened. The procedure usually is limited to patients with malignant disease. However, in selected cases, it may be of benefit for patients with benign disorders.

Assurance of a well-controlled and precisely placed intraspinal lesion makes this procedure effective and reasonably safe. Pain as high as the upper cervical area is amenable to treatment. Since general anesthesia, open surgical procedures and prolonged recuperation are avoided, it is well tolerated, even by chronically ill and debilitated patients. In the event that pain eventually recurs, the procedure can easily be repeated.

Percutaneous radiofrequency cervical cordotomy significantly augments the neurosurgical therapeutic armamentarium by extending the indications and applications of surgical treatment of pain. It merits consideration when drug therapy, electroneurostimulation, alternative ablative neurosurgery and behavioral modification therapy are ineffective or inappropriate, and can be optimum treatment in pain syndromes of malignant origin.

PHILIPP M. LIPPE, MD

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Rheumatoid Arthritis Quadriplegia

IN THE PAST FEW YEARS increasing attention has been focused on the complications of rheumatoid arthritis. It has become clear that not only is the cervical spine frequently involved in this disease, but that atlantoaxial subluxation is relatively common. Atlantoaxial subluxation may not only cause severe symptoms, it may threaten the integrity of the spinal cord and lead to quadriplegia or sudden death. It is, therefore, incumbent on physicians to recognize this complication and treat it.

Common signs and symptoms of spinal cord compression are difficult to evaluate because of joint and muscular changes. Hand paresthesias, weakness in one or both lower extremities, mild weakness of hip flexors to severe quadriplegia can occur. Reflex changes and sensory alterations are helpful.

Radiological studies, including lateral views of the cervical spine in extension and flexion, tomography and cinefluorography will show the forward subluxation of the atlas, producing compromise of the neural canal. Myelography is rarely needed.

Conservative management consists of the use of a cervical collar or brace to lessen spinal cord trauma.

Fusion to immobilize the subluxing segments of the occipital cervical junction can be done by wiring the two upper cervical segments and fusing with iliac bone. Satisfactory decompression of the spinal cord and an arrest of progressive neurological changes can be accomplished.

LYMAN MAASS, MD

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Percutaneous Thermocoagulation of the Trigeminal Ganglion

FACIAL PAIN of paroxysmal trigeminal neuralgia or tic douloureux is an intractable and disabling affliction. Current treatment follows a consecutive regimen beginning with medical management using such drugs as diphenylhydantoin (Dilantin®) and carbamazepine (Tegretol®). In the event drugs are ineffective, nerve blocks and avulsions usually are attempted. If pain recurs, operative procedures may be carried out on the trigeminal nerve, ganglion or tract through the customary subtemporal or suboccipital approach.

Percutaneous thermocoagulation of the trigeminal ganglion represents a new and effective surgical approach to the trigeminal nerve in the treatment of trigeminal neuralgia and, to a lesser extent, facial pain of other causes. Although popular in Europe several decades ago, the procedure was abandoned because of an unacceptably high morbidity and mortality. Refinements in technique made possible through advances in radiology and electronic bioengineering have assured its acceptance in this country.

The procedure is done under local anesthesia, which is usually supplemented by the intravenous administration of a short-acting barbiturate (Brevital®). Under x-ray monitoring, a needle electrode is introduced percutaneously into the gasserian ganglion through the foramen ovale. The electrode can be placed selectively into any of the three divisions depending upon the distribution of pain. Final electrode placement is verified by stimulation. A radiofrequency generator is used to make a thermal lesion, the size of which is a variable of power output and time. Lesion making is monitored by a thermistor. Through selective coagulation, pain relief can be achieved by producing marked hypalgesia in the affected division avoid-